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10/584,927	07/05/2006	Yoshiyuki Yamamoto	050389-0065	2585

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EXAMINER

GREGORIO, GUINEVER S

ART UNIT	PAPER NUMBER
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1793

MAIL DATE	DELIVERY MODE
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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/584,927	Applicant(s) YAMAMOTO ET AL.	
	Examiner GUINEVER S. GREGORIO	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1, 4, 5, 7-8, 12, 16-17, and 19-21 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 4-10 of copending Application No. 11/402,062. Although the conflicting claims are not identical, they are not patentably distinct from each other because birefringent retardation of the polarized light contains a fast and slow axis which is caused by the phase difference of the two orthogonal light waves and therefore since the two concepts are inter-related the claims are not patentably distinct from each other.

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2. Regarding claim 5, '062 teaches a single crystalline diamond wherein a concentration of nitrogen as an impurity is 0.1 to 5 ppm which encompasses by 0.01 to 100 ppm.

3. Regarding claims 7 and 8, claim 5 of '062 teaches a single crystalline diamond according to claim 1 wherein a full width at half maximum of a rocking curve X-ray diffractometry on a (400) plane is not more than 20arcsec across an entire of the single crystalline diamond which corresponds to claim 7. Although '062 does not teach hydrogen atom concentration it is known in the art that the crystal lattice of a diamond and the properties it exhibits are affected by the impurities found in the diamond. Therefore since the nitrogen concentrations with the present application and '062 overlap and the X-ray diffraction properties in the present application are commensurate with the properties claimed in '062 examiner is going to take the position that the hydrogen impurities found in the diamond claim by applicant in the present application and '062 are the same or similar concentration thereby making the claims obvious variants of each other.

4. Regarding claim 17, claim 6 of '062 recites a diameter of the single crystalline diamond is not less than 4 mm which overlaps with a diameter at least 10 mm.

5. This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

5. Claims 1-21 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 7,481,879.

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Although the conflicting claims are not identical, they are not patentably distinct from each other because the sole difference between instant claims and the patent claims is a method for testing diamond properties. However, since the diamonds taught in '789 are grown by the same method as the instant claim, i.e. a CVD growth of a single crystal diamond on a diamond substrate wherein the substrate was treated with reactive ion etching and doping the manufactured CVD single crystal diamond with nitrogen, then the properties of the grown diamond would inherently or obviously be the same as the diamonds in the instant claims and therefore react similarly when exposed to similar testing conditions.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-21 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Meguro et al. (Japanese Pub. No. 2003-277183). Meguro et al. teaches a CVD method for manufacturing a single crystal diamond on a CVD diamond substrate wherein the substrate has been modified using reactive ion etching method (Paragraphs 3 and 19). The method for producing the single crystal diamond taught by Meguro et al. is commensurate with applicant's method for producing a diamond taught on pages 9-11 of the Specification. Therefore since the method of manufacturing as recited by Meguro et al. is not patentably distinguishable from the method recited by applicant in the Specification, Examiner takes the position that the diamond taught by Meguro et al. will inherently or obviously have the same properties. Hence since the diamond taught by Meguro et al. will obviously or inherently

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posses the same properties as the diamond taught by applicant and the diamond taught by Meguro will obviously or inherently react the same as the diamond taught by applicant when exposed to the same testing conditions. For example, when the diamond produced by Meguro et al. is exposed to testing conditions such as wherein when one main surface is irradiated with a linearly polarized light considered to be the synthesis of two mutually perpendicular linearly polarized light beams, the phase difference between the two mutually perpendicular linearly polarized light beams exiting another main surface on the opposite side is, at a maximum, not more than 50 nm per 100 μm of crystal thickness over the entire crystal.

7. Regarding claim 2, Meguro et al. teaches a process for which a diamond single crystal board with greater than 100 μm in thickness is prepared (Paragraph 29).

8. Regarding claim 3, it is known in the art that the resistivity of an undoped diamond crystal is $10^{16} \Omega \text{ cm}$ at room temperature which overlaps with 10^{12} .

Furthermore, if one of ordinary skill in the art wants to lower the resistivity of the diamond crystal then one would merely have to dope the manufactured crystal with an impurity such as boron. Therefore one of ordinary skill in the art would be able to adjust the amount of dopant to obtain the desired resistivity.

Claim Rejections - 35 USC § 103

6. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Linares et al. (US Pub. No. 2003/0131787) in view of Meguro et al.

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7. Linares et al. teaches a single crystalline diamond structure formed by CVD process. Linares does not teach treating the surface of the diamond substrate with using reactive ion etching, RIE. Meguro et al. teaches a CVD method for manufacturing a single crystal diamond on a CVD diamond substrate wherein the substrate has been modified using reactive ion etching method and thereby improves the quality of the manufactured diamond because of the correlation between crystallinity of the substrate and the diamonds grown on the substrate (Paragraphs 3, 8, 15 and 19). It would have been obvious to one of ordinary skill in the art at the time of the invention to treat the surface of the diamond substrate using a method such as reactive ion etching because RIE improves the quality of the manufactured single crystal CVD diamond thereby reducing stress and possibility of fracturing the manufactured diamond.

8. Therefore since Linares et al. in view of Meguro et al. teaches a diamond made by the same method as taught by applicant, a vapor phase synthesis diamond on a vapor phase synthesis diamond substrate in which the substrate has been treated with RIE, Examiner takes the position that the product created by Linares' method will exhibit the properties claimed by applicant such as the phase difference exhibited between two mutually linearly perpendicular polarized light irradiated on a surface of the crystal.

9. Regarding claim 2, Linares et al. teaches a thickness of 1000 micrometers which is encompassed by 100 to 1500 micrometers (paragraph 236, line 2).

10. Regarding claim 3, it is known in the art that the resistivity of an undoped diamond crystal is $10^{16} \Omega \text{ cm}$ at room temperature which overlaps with 10^{12} .

Furthermore, if one of ordinary skill in the art wants to lower the resistivity of the

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diamond crystal then one would merely have to dope the manufactured crystal with an impurity such as boron. Therefore one of ordinary skill in the art would be able to adjust the amount of dopant to obtain the desired resistivity.

11. Regarding claim 4, Linares et al. teaches the nitrogen content affect the electron spin resonance (paragraph 136, line 15). Therefore it would be obvious to one of ordinary skill in the art to adjust the nitrogen content of the synthetic diamond in order to obtain the desired electron spin resonance measurement.

12. Regarding claims 5 and 18, Linares et al. teaches a nitrogen content of a final CVD diamond crystal which has less than 10 to 20 ppm incorporated into the lattice which is encompassed by 0.01 to 100 ppm and overlaps with 0.01 to 5 ppm (paragraph 115, lines 16-18).

13. Regarding claim 6, Linares et al. teaches a CVD method to produce a single crystal diamond using hydrogen as the gas stream which is the same method used by applicant (paragraph 150, line 7). Therefore examiner takes the position that the impurities levels obtained by the prior art would commensurate with the impurity levels claimed by applicant.

14. Regarding claims 7-19 Linares et al. teaches the properties of synthetic monocrystalline diamonds depend largely on defects or impurities in the crystal (paragraph 7, lines 1-3). Furthermore, Linares et al. teaches by controlling these factors, one can control no only the electrical properties, but also other properties of the diamond, including its optical and mechanical properties (paragraph 7, lines 3-6).

Linares et al. teaches varying the amount of impurities to obtain a monosynthetic

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diamond based with specific electrical properties (claims 1, 37, and 38). Examiner takes the position that it would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the impurities to the necessary amount in order to obtain the desired electrical properties. Furthermore, it is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA1980). Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have determined the optimum value of a cause effective variable such as amount of dopant through routine experimentation in the absence of a showing of criticality in the claimed size. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). Additionally, it would have been obvious to one of ordinary skill in the art at the time of the invention to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 105 USPQ 233 (CCPA 1955).

15. Regarding claims 16 and 17, examiner takes the position that the diameter of the diamond would be limited by the size of the vapor deposition device and the size of the substrate both of which one of ordinary skill in the art could easily control based on the desired size of the synthetic diamond.

16. Regarding claims 20 and 21, Linares et al. teaches applications for synthetic CVD diamonds comprising semiconductor devices, field effect transistors, light emitting diodes, high voltage switches, p-n junctions, Schottky diodes, surgical device contact surfaces, sensor devices, windows, anvils, etc. (paragraph 17).

Conclusion

9. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 02/19/2009 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GUINEVER S. GREGORIO whose telephone number is (571)270-5827. The examiner can normally be reached on Monday-Thursday, 10:30-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curt Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gsg
May 11, 2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793